

**OMICRON**



# TEST UNIVERSE

World Leader in Innovative Power System Testing Solutions

P R I M A R Y  
T E S T I N G

C P - L I N E C A T A L O G



# Company Profile

## CUSTOMER AND COMPANY PROFILE

### About our customers



Typical customers of our CP product line, which represents our products for primary testing, are engineers and technicians working mainly in commissioning, maintenance testing, and test fields of

- Power transformers,
- Current transformers,
- Voltage transformers,
- Power cables,
- Circuit breakers,
- Rotating machines,

and other electrical power system equipment in utilities and industry.

Our test equipment is also used for automated measuring of resistances (contact resistances, winding resistances, grounding resistances, cable impedances), power factor, dissipation factor, and capacitance, but also for single-phase testing of primary and secondary protective relays (I>, V>, V< or frequency relays.)

### About OMICRON



OMICRON is an international company providing innovative solutions for primary and secondary testing.

Combining innovation, leading edge technology, and creative software solutions, OMICRON's sales have earned world leader status for OMICRON within this niche market. With sales in more than 100 countries, offices in Europe, the United States, and Asia, and a worldwide network of distributors and representatives, OMICRON has truly established its reputation as a supplier of the highest quality.

The automated testing and documentation capabilities of OMICRON testing solutions are important benefits in light of the changing market conditions resulting in restructured organizations required to "do more with less".

Today, OMICRON's products revolve around a testing concept which provides the solutions to many challenges created by these competitive trends in the marketplace. This integration of lightweight and reliable hardware with flexible and user-friendly software is referred to as the OMICRON Test Universe.

Services in the area of consulting, commissioning, relay testing and training make OMICRON's product range complete.

Specialization in power system testing along with visionary leadership allows OMICRON to continue with innovative developments for its testing solutions to meet the customer needs of the 21st century.

### Subjects covered in other catalogs

Secondary Testing - CM line catalog  
OMICRON's product range in the area of secondary testing.

For a detailed list of currently available literature, please refer to  
**[www.omicron.at/support/literature](http://www.omicron.at/support/literature)** or **[www.omicronusa.com/support/literature](http://www.omicronusa.com/support/literature)**.



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## OVERVIEW

### Multifunctional Primary Test System for Substation Commissioning and Maintenance

This world-wide unique system allows for automated testing of power transformers, CTs, VTs, resistance testing, and more.

Providing up to 800 A (or 2000 A with current booster) and 2000 V with a frequency range of 15-400 Hz, it also comes complete with an integrated PC. Its software routines test a wide range of substation equipment, and automatically create customizable reports. The compact design (29 kg / 64 lbs) and the innovative software save testing time and minimize transportation costs.

Analog voltages and currents can be measured with very high precision. Its  $\Omega$  meters offer ranges from  $\mu\Omega$  to  $k\Omega$  to allow for a wide variety of applications. Testing of unconventional equipment, such as Rogowski Coils or current sensors completes the spectrum. Additional applications can be added with the use of flexible accessories to include tangent delta / power factor testing and primary measurements of power system equipment.

#### LIGHTWEIGHT

29 kg / 64 lbs

- Less than one fourth the weight of equivalent conventional equipment
- Lower transportation costs saves money
- Easier handling reduces manpower needs
- Low weight reduces injury potential

#### ONE TEST UNIT FOR MULTIPLE USES

- Replaces need for multiple test sets (e.g. high current and voltage sources,  $\mu\Omega$  meter)
- Saves time by eliminating need for multiple training
- User-friendly interface reduces training time to one day

#### AUTOMATED TESTING AND REPORTING

- Prepare test plans ahead of time in office (saves time in field testing phase)
- Set up test once, push button to start (saves testing time)
- Results automatically saved (saves time and reduces errors by eliminating manual recording of data)
- Automatic report generation (saves time by eliminating manual report writing; accelerates project completion)
- Print reports via external PC

#### SAFETY FEATURES

- Emergency shut off button
- Safety key lock (block unauthorized use)
- Overvoltage protection on all inputs and outputs

#### PREPARED FOR THE FUTURE

- Able to test unconventional equipment like Rogowski Coils or current sensors
- Unit accessible in a network or with direct PC connection via standard internet protocols
- Maximum flexibility for future enhancements by using DSPs for signal generation and switched mode amplifier technique

#### CURRENT TRANSFORMER (CT)

automatic testing of:

- Ratio, burden and polarity
- Phase and magnitude error
- Excitation curve
- Winding resistance
- Secondary burden
- Dielectric withstand voltage (2kV AC)
- CT circuit continuity

#### VOLTAGE TRANSFORMER (VT)

automatic testing of:

- Ratio and polarity
- Phase and magnitude error
- Secondary burden
- Dielectric withstand voltage (2kV AC)
- VT circuit continuity

#### POWER TRANSFORMER

- Ratio
- Winding resistance
- Tap changer testing
- Excitation current
- Short-circuit impedance measurement
- Leakage reactance

#### RESISTANCE TESTING

- Contact resistance ( $\mu\Omega$ )
- Winding resistance ( $\mu\Omega$  -  $k\Omega$ )
- Ground resistance
- Measuring of complex impedances (winding impedances, cable impedances, etc.)

#### PROTECTION RELAYS

- Single phase testing of primary and secondary relays ( $I>$ ,  $V>$ ,  $V<$ , or frequency relays)

#### ADDITIONAL APPLICATIONS

- **TANGENT DELTA / POWER FACTOR TEST**  
Add the CP TD1 accessory for the most flexible insulation diagnosis system in the industry.

- **LINE & GROUND IMPEDANCES, K-FACTOR, MUTUAL COUPLING**  
Add the CP CU1 accessory for the safest, most accurate system for measuring primary power system parameters.



# CPC 100 Technical Data

## INTERFACE ELEMENTS



1) 6 A or 130 V AC Output

2) Current Output 6 A DC

3) Current Measuring Input I AC or DC

4) Voltage Measuring Input 300 V AC

5) Low Level Voltage Measuring Input 3 V AC

6) Voltage Measuring Input V DC / 2-wire resistance measurement

7) Binary input for potential-free contacts or voltages up to 300 V DC

See page 7 for details on outputs and inputs.

8) Safety key lock

If locked, the quantities which are currently put out are frozen. The unit does not accept any commands except for an Emergency stop.

9) Signal Lights

Green light indicates a safe operation, whereas red light indicates an operation with hazardous voltage and/or current levels at the outputs

10) Emergency stop button

11) Keys for quick selection of your application

12) Keys for quick selection of your desired view

13) LCD monitor

14) Soft-touch keys changing according to the selected application

15) Keys for selecting stacked test cards

16) Numerical keyboard

17) Advanced jog-dial hand wheel with "click" (Enter) function

The hand wheel allows for navigation within test cards, within other views, or across views, and it also allows for the entering of values. In 'entering' mode, the wheel's adaptive acceleration function will increase / decrease the input value in ever bigger steps, if the wheel is turned fast. Slow turning will increase / decrease the value in ever smaller steps.

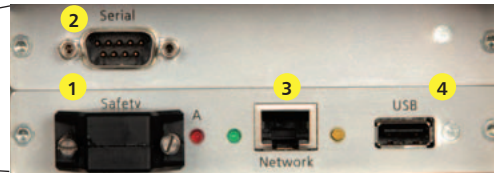
18) Up / down keys for navigation and entering values

19) Test start / stop button



# CPC 100 Technical Data

## INTERFACE ELEMENTS (CONTINUED)



- 1) Plug to connect external functions
  - external "test start / stop" push-button
  - external I/O signal lights
- 2) Serial interface for devices like CP TD1
- 3) Connection of CPC 100 to a network or direct connection to a PC's network connector
- 4) Connection of a USB memory stick



- 1) Grounding terminal
- 2) High AC Voltage Output 2 kV AC (1 A...5 A AC)
- 3) Ext. BOOSTER  
for the connection of the booster options
- 4) High DC current output 400 A DC
- 5) High AC current output 800 A AC
- 6) Mains power supply, 1 phase, 85 V-264 V AC
- 7) Overcurrent protection
- 8) POWER switch

# CPC 100 Technical Data

## TECHNICAL DATA

The output is either voltage or current, and is automatically selected by the software or manually by the user. Current and voltage outputs are overload and short circuit proof and protected against over temperature.

Generator / Output							
Current outputs							
Range	Amplitude	t <sub>max</sub> <sup>1</sup>	V <sub>max</sub> <sup>2</sup>	Power <sub>max</sub> <sup>2</sup>	f		
800 A AC <sup>3</sup>	0...800 A	25 s	6.0 V	4800 VA	15-400 Hz		
	0...400 A	8 min	6.4 V	2560 VA	15-400 Hz		
	0...200 A	> 2 h	6.5 V	1300 VA	15-400 Hz		
6 A <sup>10</sup>	0...6 A	> 2 h	55 V	330 VA	15-400 Hz		
3 A <sup>10</sup>	0...3 A	> 2 h	110 V	330 VA	15-400 Hz		
400 A DC	0...400 A	2 min	6.5 V	2600 W	DC		
	0...300 A	3 min	6.5 V	1950 W	DC		
	0...200 A	> 2 h	6.5 V	1300 W	DC		
6 A DC <sup>4,10</sup>	0...6 A	> 2 h	60 V	360 W	DC		
2000 A AC <sup>3</sup> with an optional Current Booster. Please see page 21 for details.							
Voltage outputs							
Range	Amplitude <sup>5</sup>	t <sub>max</sub>	I <sub>max</sub>	Power <sub>max</sub> <sup>5</sup>	f		
2 kV AC <sup>3</sup>	0...2 kV	1 min	1.25 A	2.5 kVA	15-400 Hz		
	0...2 kV	> 2 h	0.5 A	1.0 kVA	15-400 Hz		
1 kV AC <sup>3</sup>	0...1 kV	1 min	2.5 A	2.5 kVA	15-400 Hz		
	0...1 kV	> 2 h	1.0 A	1.0 kVA	15-400 Hz		
500 V AC <sup>3</sup>	0...0.5 kV	1 min	5.0 A	2.5 kVA	15-400 Hz		
	0...0.5 kV	> 2 h	2.0 A	1.0 kVA	15-400 Hz		
130 V AC <sup>10</sup>	0...130 V	> 2 h	3.0 A	390 VA	15-400 Hz		
Internal measurement of outputs							
Output	Range	Guaranteed accuracy			Typical accuracy <sup>6</sup>		
		Amplitude		Phase	Amplitude		Phase
		Reading	Full Scale	Full Scale	Reading	Full Scale	Full Scale
800 A AC	-	0.20 %	0.20 %	0.20 °	0.10 %	0.10 %	0.10 °
400 A DC	-	0.40 %	0.10 %	-	0.20 %	0.05 %	-
2 kV AC	2000 V	0.10 %	0.10 %	0.20 °	0.05 %	0.05 %	0.10 °
	1000 V	0.10 %	0.10 %	0.30 °	0.05 %	0.05 %	0.15 °
	500 V	0.10 %	0.10 %	0.40 °	0.05 %	0.05 %	0.20 °
	5 A	0.40 %	0.10 %	0.20 °	0.20 %	0.05 %	0.10 °
	50 mA	0.10 %	0.10 %	0.20 °	0.05 %	0.05 %	0.10 °

Guaranteed values valid over one year within 23 °C ± 5 °C (73 °F ± 10 °F), in the frequency range of 45 ... 65 Hz or DC. Accuracy values indicate that the error is smaller than +/- (Value read \* Reading error + Full Scale of the range \* Full Scale Error).

<sup>1</sup> With mains voltage 230 V with 2 x 6 m high current cable at 23 °C ± 5 °C (73 °F ± 10 °F) ambient temperature.

<sup>2</sup> Signals below 50 Hz or above 60 Hz with reduced values possible.

<sup>3</sup> Output can be synchronized with mains.

<sup>4</sup> The input / output is protected with surge arrestors between the pins and against protective earth. In case of energies above a few hundred Joule the lightning arrestors apply a permanent short circuit to the input / output.

<sup>5</sup> Signals below 50 Hz or above 200 Hz with reduced values possible.

<sup>6</sup> 98 % of all units have an accuracy better than specified as Typical.

<sup>7</sup> Input is galvanically separated from all other inputs.

<sup>8</sup> V1 and V2 are galvanically coupled but separated from all other inputs.

<sup>9</sup> There are power restrictions for mains voltages below 190 V AC.

<sup>10</sup> Fuse protected.

<sup>11</sup> Error of reading < than ± value.

Inputs								
Measuring inputs								
Input	Imped.	Range	Guaranteed accuracy			Typical accuracy <sup>6</sup>		
			Amplitude		Phase	Amplitude		Phase
			Reading	Full Scale	Full Scale	Reading	Full Scale	Full Scale
I AC/DC <sup>2,7</sup>	< 0.1 Ω	10 A AC	0.10 %	0.10 %	0.20 °	0.05 %	0.05 %	0.10 °
		1 A AC	0.10 %	0.10 %	0.30 °	0.05 %	0.05 %	0.15 °
		10 A DC	0.05 %	0.15 %	-	0.03 %	0.08 %	-
		1 A DC	0.05 %	0.15 %	-	0.03 %	0.08 %	-
V1 AC <sup>8</sup>	500 kΩ	300 V	0.10 %	0.10 %	0.20 °	0.05 %	0.05 %	0.10 °
		30 V	0.10 %	0.10 %	0.20 °	0.05 %	0.05 %	0.10 °
		3 V	0.20 %	0.10 %	0.20 °	0.10 %	0.05 %	0.10 °
		300 mV	0.30 %	0.10 %	0.20 °	0.15 %	0.05 %	0.10 °
V2 AC <sup>8</sup>	10 MΩ	3 V	0.05 %	0.15 %	0.20 °	0.03 %	0.08 %	0.10 °
		300 mV	0.15 %	0.15 %	0.20 °	0.08 %	0.08 %	0.10 °
		30 mV	0.20 %	0.50 %	0.30 °	0.10 %	0.25 %	0.15 °
		10 V	0.05 %	0.15 %	-	0.03 %	0.08 %	-
V DC <sup>4,7</sup>	500 kΩ	1 V	0.05 %	0.15 %	-	0.03 %	0.08 %	-
		100 mV	0.10 %	0.20 %	-	0.05 %	0.10 %	-
		10 mV	0.10 %	0.30 %	-	0.05 %	0.15 %	-
		10 mV	0.10 %	0.30 %	-	0.05 %	0.15 %	-

• Automatic range switching

• Galvanically separated potential groups: I AC/DC ; V1 & V2 ; V DC

• AC frequency range 15 - 400 Hz

• Protection of I AC/DC input: 10 A FF fuse<sup>4</sup>

Binary input for dry contacts or voltages up to 300 V DC<sup>2</sup> - see (7) on page 5

Trigger criteria Toggling with potential free contacts or voltages of up to 300 V.

Input impedance > 100 kΩ

Response time 1 ms

Ω meter (DC)					
Mode	Connection	Range	Current	Accuracy (full scale)	
				Guaranteed	Typical
0.5 μΩ ... 12.5 mΩ	4-wire	400 A DC	400 A	0.85 %	0.45 %
10 μΩ ... 1 Ω	4-wire	6 A DC	6 A	0.60 %	0.35 %
100 μΩ ... 10 Ω	4-wire	6 A DC	1 A	0.40 %	0.25 %
0.2 Ω ... 20 kΩ	2-wire	V DC in	<5 mA	1.00 % + 0.2 Ω <sup>11</sup>	0.50 % + 0.1 Ω <sup>11</sup>

## General

Display

1/4 VGA greyscale LCD display

USB Memory

USB 2.0

Guaranteed communication of USB sticks supplied by OMICRON

## Power Supply

Single-phase, nominal<sup>9</sup>

100 V AC ... 240 V AC, 16 A

Single-phase, permissible

85 V AC ... 264 V AC (L-N or L-L)

Frequency, nominal

50/60 Hz

Power consumption

7000 VA short time (< 10 sec)

Connection

IEC320/C20

## Environmental conditions

Operating temperature

-10 ... +55 °C (+14 ... +131 °F)

Storage temperature

-20 ... +70 °C (-4 ... +158 °F)

Humidity range

Rel. humidity 5 ... 95 %, non-condensing

Shock

IEC68-2-27 (operating) 15 g / 11 ms half sine

Vibration

IEC68-2-6 (operating) 10 ... 150 Hz : 2g

## EMC Emission

Europe

EN 61000-6-4, EN 61000-3-2

International

IEC 61000-6-4; IEC 61000-3-2

USA

FCC Subpart B of Part 15 Class A

## EMC Immunity

Europe

EN 61000-6-2; EN 61000-4-2/3/4/8

International

IEC 61000-6-2; IEC 61000-4-2/3/4/8

Europe

EN 61010-1

## Safety

International

IEC 61010-1

## Weight

Produced and tested in an EN ISO 9001 certified company

## Dimensions

29 kg (64 lbs), robust case with cover

468 x 394 x 233 mm (18.6 x 15.5 x 9.2 ")

(W x H x D with cover, without handles)

# CPC 100 Applications

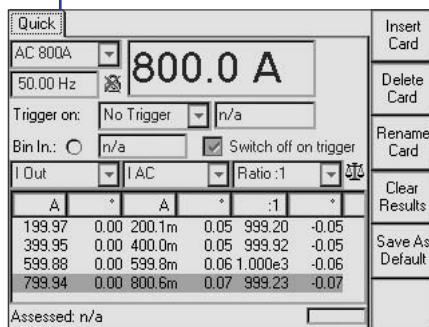
## APPLICATIONS



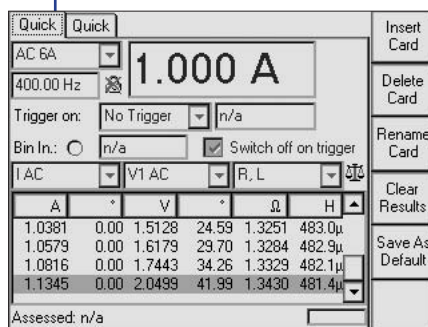
The software described in the Software section runs in the embedded processor within the CPC 100 and can be operated with front panel control.

No additional PC is required.

## Quick Manual Control



CPC 100 front panel displaying a CT ratio measurement



### Measurement of the complex impedances of a transformer

## Quick

Testing almost any function using direct manual control of the current and voltage outputs and measurements

This function allows any manipulation of the selected output range of the CPC 100. All output terminals available on the CPC 100 can be selected and controlled.

Measuring two quantities in two columns such as AC or DC voltages in amplitude and phase angle, AC or DC currents in amplitude and angle, or the frequency of any selected output, is easily done by selecting the desired quantities.

Quick also automatically performs calculations derived from the quantities described above, such as S, P, Q, Z, R, R-X, R-L, R-C<sub>u</sub>, ratio:1, ratio:5, ΔV and ΔI, and displays them in the third column.

Any relevant measured value can easily be stored by pressing Keep Result. Thus, all important results are arranged and displayed in a table, and can be further investigated at any time. The entire testing session can be saved as a file.

A trigger functionality allows for triggering to a certain event, such as reaching a threshold value or the switching of a contact. The trigger can be binary or analog, or it can be an overload of the unit. For each trigger event, both the current output value and the delay time are measured, which allows the testing of pick up and drop off values of primary relays.

Complex impedances of transformers, inductors or capacitors can be measured. The amplifier technology used enables a wide range of testing frequencies different from the mains frequency. The built-in digital filters allow for sensitive and selective measuring without interference problems. With this concept, a lot of tests can be performed with small test signals (instead of using big and heavy conventional test equipment with high test signals at mains frequency).

Reporting is done automatically.

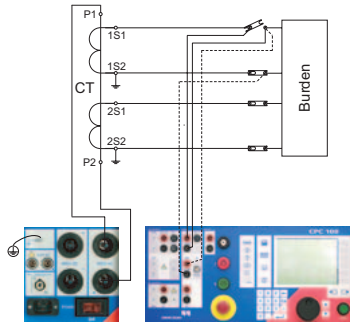
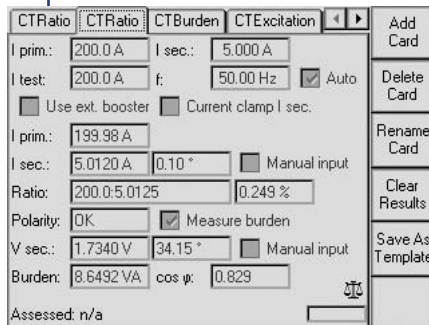


# CPC 100 Applications

## CURRENT TRANSFORMER (CT)

### CT Ratio, Burden, and Excitation

Note: for input current measuring, the direct current input or the current probe can be used.



### CT Ratio Burden

Tests ratio, polarity (and burden) with direct injection to CT primary current input and measuring of secondary output

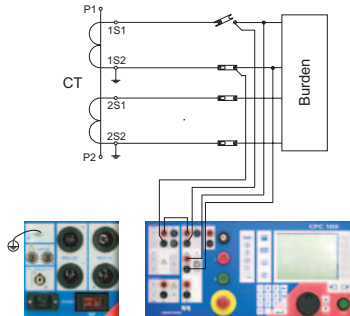
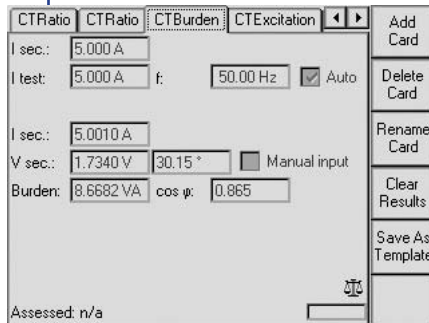
After entering I primary, I secondary and test current, and pressing the Start button, the test card measures:

- Secondary current with magnitude and angle (CT angle error)
- Ratio with error in percent
- Polarity on the CT terminals
- Connected burden in VA and power factor (cos φ)

Duration of the test: ~ 3s including automatic reporting

Output: up to 800 A (2000 A) AC

Input: up to 10 A AC / 3 V or 300 V via current clamp.



### CT Burden

Measures connected CT burden load with direct injection of secondary current with disconnected CT

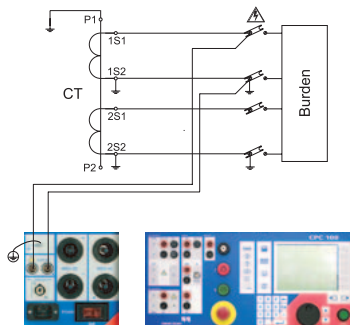
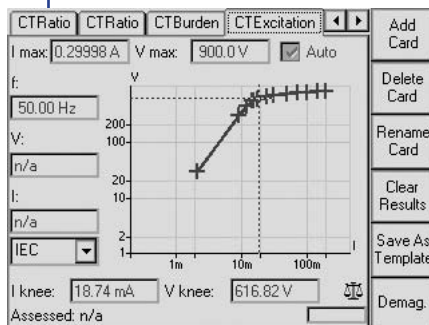
After entering the secondary nominal current and the test current, and pressing the Start button, the test card measures:

- Secondary voltage in magnitude and angle
- Connected burden in VA and power factor (cos φ)

Duration of the test: ~ 3s including automatic reporting

Output: up to 6 A AC

Input: up to 10 A AC / 3 V via current clamp and 300 V



### CT Excitation

Tests the excitation curve

The necessary wiring is only two leads from the voltage output to the open secondary wiring of the CT. After entering the current and voltage limits and pressing the Start button, the test card will automatically record the CT excitation curve according to IEC 60044-1, ANSI 45°, or ANSI 30° standards, and the knee point will be automatically calculated. After the test the core is demagnetized. The test is done using a regulated voltage source.

Duration of the test: ~ 30 s including automatic reporting with recorded excitation curve, and calculated knee point voltage.

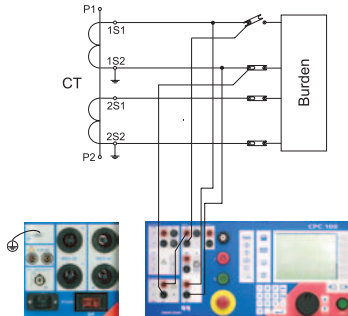
Output: up to 2000 V AC

# CPC 100 Applications

## CT (CONTINUED)

### Winding Resistance, Voltage Withstand Test, and CT Ratio V

PolCheck	Resistance	RWinding	Comment	▶	◀	Add Card
I test:	5.000 A	R min:	80.00 $\mu\Omega$			Delete Card
I DC:	4.9990 A	R max:	2.0000 $\Omega$			Rename Card
V DC:	2.5430 V					Clear Results
R meas.:	508.7 m $\Omega$	Time:	31.000 s			Save As Template
Interval:	10.000 s	Dev.:	0.01 %			Save Results
<input checked="" type="checkbox"/> Temperature compensation for Cu						
T meas.:	25.0 °C					
T ref.:	70.0 °C					
R targ.:	608.4 m $\Omega$					
Assessed: n/a						



### Winding Resistance

Measures CT winding resistance

After entering the test current and pressing the Start button, the test card

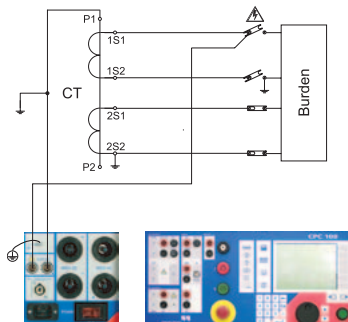
- displays the deviation of the measurement over time during the period of charging the winding
- automatically performs a discharging of the winding after saving the measurement
- measures the DC voltage
- measures the resistance
- (optionally) compensates the temperature behavior of copper, where the applied temperature compensation calculates the resistance for working temperature

Duration of the test: depending on the charging time. After the charging period, the user creates the report by pressing Save Results.

Output: up to 6 A DC or 100 A DC (6.5 V)

Input: up to 10 V DC

VTElectronics	TRRatio	VWithstand	PolChe	▶	◀	Add Card
V test:	2000.0 V	f:	50.00 Hz			Delete Card
<input checked="" type="checkbox"/> Switch off on IAC >:		0.00100 A				Rename Card
<input checked="" type="checkbox"/> Auto		Time:	30.000 s			Clear Results
V AC:	2.000 kV					Save As Template
I AC:	360.0 $\mu$ A	I max:	560.0 $\mu$ A			
Assessed: n/a						



### Voltage Withstand

Tests the voltage withstand capability of the insulation between primary and secondary winding or ground and secondary winding

After entering the test voltage and the duration, and pressing the Start button, the test card

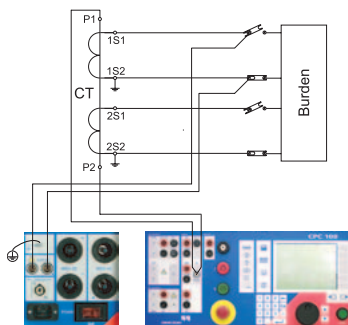
- determines the leakage current flowing through the insulation.

The current threshold for maximum leakage current can be entered. The CPC 100 will automatically switch off if the maximum leakage current is exceeded.

Duration of the test: can be set by the user; the test report will be created after the test automatically.

Output: up to 2 kV AC

CTBurden	CTExcitation	CTRatioV	CTRogd	▶	◀	Add Card
I prim.:	200.0 A	I sec.:	5.000 A			Delete Card
V test:	50.00 V	f:	50.00 Hz			Rename Card
<input checked="" type="checkbox"/> Auto						Clear Results
V sec.:	50.010 V					Save As Template
V prim.:	1.2536 V	0.15 °	<input type="checkbox"/> Manual input			
Ratio:	200.0:5.0134	0.267 %				
Polarity:	OK					
Choose test card.						



### CT Ratio V

Tests ratio and polarity with direct injection of the voltage to the CT secondary input (common method for bushing CTs)

After entering primary and secondary current and the test voltage, and pressing the Start button, the test card

- measures the actual ratio
- calculates the deviation of amplitude and phase angle of the voltage of the CT primary side.

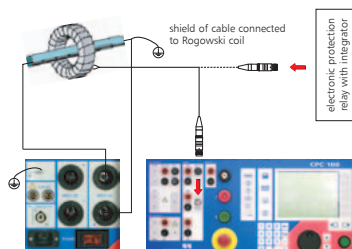
Duration of the test: ~ 3s including automatic reporting  
Output up to 130 V.

Input: up to 3 V and 300 V AC



## CT Ratio Rogowski, CT Ratio Low Power

Quick: CT Rogowski		Insert Card
I prim.: 240.0 A	V sec.: 150.0 mV	Delete Card
I test: 240.0 A	f nom.: 50.00 Hz	Rename Card
<input type="checkbox"/> Use ext. booster	f: 50.00 Hz <input checked="" type="checkbox"/> Auto	Clear Results
I prim.: 239.87 A	<input type="checkbox"/> Man. inp.	Save As Default
V sec.: 149.9 mV		
I sec.: 239.84 A	0.16°	
Ratio: 240.0:239.97	-0.012 %	
Polarity: OK		
Assessed: n/a		



### CT Ratio Rogowski

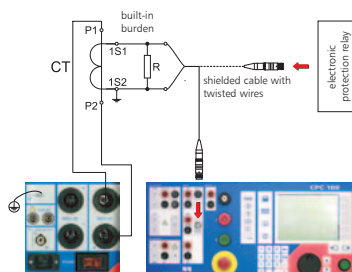
Measures the ratio for CTs with Rogowski coil principle (induced voltage is proportional to the conductor current differentiated with respect to time)

After entering primary current, secondary voltage, test current, nominal frequency and pressing the Start button, the test card

- measures the amplitude of the injected current
- measures the Rogowski coil's output voltage and phase angle
- calculates the actual ratio
- calculates the deviation from the nominal ratio

Duration of the test: ~ 5 s including automatic reporting  
Output: up to 800 A (2000 A with Current Booster CP CB2)  
Input: up to 3 V AC

CTRatioV	CT Rogowski	CT LowPower	VTR	Add Card
I prim.: 200.0 A	V sec.: 22.5 mV			Delete Card
I test: 200.0 A	f: 50.00 Hz	<input checked="" type="checkbox"/> Auto		Rename Card
<input type="checkbox"/> Use ext. booster				Clear Results
I prim.: 199.99 A	<input type="checkbox"/> Manual input			Save As Template
V sec.: 22.53 mV	0.00°			
Ratio: 200.0:22.53 A/mV	0.138 %			
Polarity: OK				
Assessed: n/a				



### CT Ratio Low Power

Measures the ratio for CTs with low power principle (output voltage is proportional to primary current)

After entering primary current, secondary voltage, and the test current, and pressing the Start button, the test card

- measures the amplitude of the injected current
- measures the low power output voltage and phase angle
- calculates the actual ratio
- calculates the deviation from the nominal ratio

Duration of the test: ~ 5 s including automatic reporting  
Output: up to 800 A (2000 A with Current Booster CP CB2)  
Input: up to 3 V AC

### Polarity Checker

The Polarity Checker option can be found in the Accessories section, page 22.



# CPC 100 Applications

## VOLTAGE TRANSFORMER (VT)

### VT Ratio, Polarity, and Burden, Electronic VT

CTRogowski CTLowPower VTRatio VTBurden Add Card

V prim.: 10000.0 V V sec.: 100.0 V

☒ 1/√3 ☒ 1/√3 ☐ 1/3

V test: 2000.0 V f: 50.00 Hz ☒ Auto

V prim.: 2.000 kV

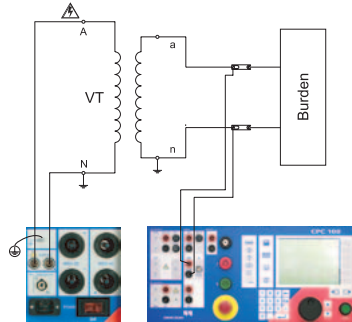
V sec.: 20.087 V 0.20 \* ☐ Manual input

Ratio: 10000.0/√3:100.43/√3 0.431 %

Polarity: OK

Assessed: n/a

Delete Card  
Rename Card  
Clear Results  
Save As Template



### VT Ratio and Polarity

Measures the capacitive or inductive VT ratio and polarity

After entering the primary voltage, secondary voltage and test voltage, and pressing the Start button, the test card

- measures amplitude and phase of the voltage on the transformer's secondary side
- calculates the actual ratio, the deviation and the polarity

Duration of the test: ~ 5 s including automatic reporting

Output up to 2 kV

Input: up to 300 V AC

CTLowPower VTRatio VTBurden VTElectr Add Card

V sec.: 100.00 V

☒ 1/√3 f: 50.00 Hz ☒ Auto

V test: 57.70 V ☐ Current clamp I sec.

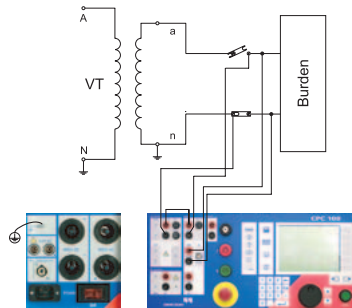
V sec.: 57.741 V

I sec.: 22.04 mA -23.60 \* ☐ Manual input

Burden: 1.2726 VA cos φ: 0.916

Assessed: n/a

Delete Card  
Rename Card  
Clear Results  
Save As Template



### VT Burden

Measures the connected secondary burden of the VT

After entering the nominal secondary voltage and the test voltage, and pressing the Start button, the test card measures

- the connected secondary burden with voltage injection on the VT's secondary side
- the connected secondary burden in VA and the power factor ( $\cos \phi$ ) including the secondary current and the angle between voltage and current

Duration of the test: ~ 5s including automatic reporting

Output up to 130 V AC

Input: up to 10 A AC and 300 V AC

VTRatio VTBurden VTElectronics TRRatio Add Card

V prim.: 10000.0 V V sec.: 1.0000 V

☒ 1/√3 ☒ 1/√3 ☐ 1/3

V test: 2000.0 V f: 50.00 Hz ☒ Auto

V prim.: 2.000 kV

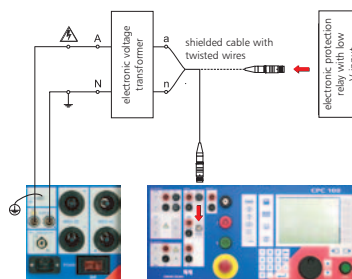
V sec.: 200.4 mV 0.05 \* ☐ Manual input

Ratio: 10000.0/√3:1.002/√3 0.205 %

Polarity: OK

Assessed: n/a

Delete Card  
Rename Card  
Clear Results  
Save As Template



### Electronic Voltage Transformer

Measures ratio and polarity of non-conventional electronic VTs

After entering the primary voltage, the secondary voltage and the test voltage, and pressing the Start button, the test card

- measures the low level secondary voltage
- calculates the actual ratio, the deviation, and the polarity.

Duration of the test: ~ 5s including automatic reporting

Output: up to 2 kV

Input: up to 3 V or 300 V AC

### Voltage Withstand Test

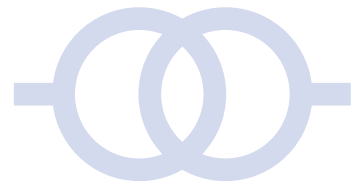
The voltage withstand test is described in the CT section, page 10.

### Polarity Checker

The Polarity Checker option can be found in the Accessories section, page 22.

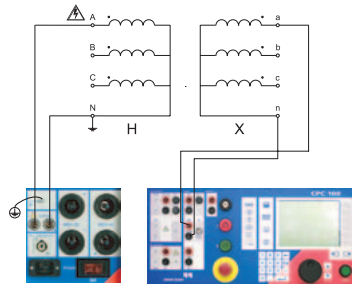
# CPC 100 Applications

## POWER TRANSFORMER



### Power Transformer Ratio, Tap Changer Test

VTBurden		VTElectronics		TRRatio		VWithst	
V prim:	110000.0 V	V sec:	10000.0 V				
<input checked="" type="checkbox"/> 1/4/3		<input type="checkbox"/> 1/4/3 Ratio:	6.3509				
V test:	2000.0 V	f:	50.00 Hz				
I prim:	640.0 $\mu$ A		3.14 °				
Tap:	014	Count down					
Tap	VPrim	VSec		*	%		
013	1.999k	314.96	1.25	6.35	0.013		
012	1.999k	312.01	1.35	6.41	-0.932		
014	1.999k	308.64	1.25	6.48	-2.034		
Assessed: n/a							



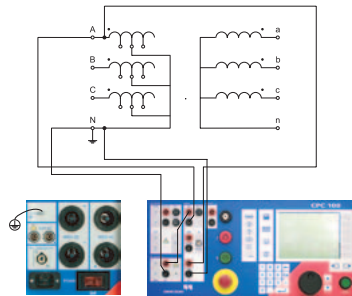
### Transformer Ratio (per Tap)

Measures ratio and excitation current per tap

For this test, a test voltage of up to 2 kV is injected on the transformer high voltage side. This voltage is measured internally with high precision. The voltage (amplitude and phase angle) on the low level voltage winding is measured back via the measuring input. The ratio is calculated automatically. The excitation current in amplitude and phase angle is also measured and reported.

Duration of the test: ~ 5 s per tap including automatic reporting  
Output: up to 2 kV  
Input: up to 300 V

Resistance		RWinding		TRTapCheck		RGrow	
I test:	1.000 A	Interval:	10.000 s				
I DC:	n/a	T meas.:	25.0 °C				
V DC:	n/a	T ref.:	70.0 °C				
Tap	007	Count up					
Tap	R meas.Dev.	R ref.	Ripple	Slope			
	$\Omega$	%	$\Omega$	%	A/s		
001	508.7m	0.42	608.4m	2.11	-11.64m		
002	528.5m	0.52	632.4m	2.78	-14.12m		
003	542.6m	0.52	659.7m	2.23	-17.32m		
004	568.8m	0.22	678.4m	2.68	-13.45m		
007	589.7m	1.53	693.3m	42.31	-628.5m		
Assessed: n/a							



### Resistance and Continuity of OLTC (per Tap)

Measures winding resistance per tap and detects interruptions of on-load tap changer (OLTC) diverter switches

The voltage drop at the winding resistance is measured with a sense line. The resistance value of each tap can easily be saved to a table containing all taps. An automatic temperature compensation is possible. Interruptions of the current because of a faulty diverter can be detected.

Duration of the test: depends on the inductivity of the winding inductance. Due to the high output voltage of up to 65 V, testing time is reduced  
Output: up to 6 A DC (65 V) or up to 100 A DC (6.5 V)  
Input: up to 10 V DC and 10 A DC

### Leakage Reactance

A test template to determine the leakage reactance is provided. For the measurement the sequencer card is used and the results are carried out in Excel.

### Voltage Withstand Test

The voltage withstand test is described in the CT section, page 10.

### Winding Resistance

The winding resistance test is described in the CT section, page 10.

### Power Factor

See CPC 100 Accessories - CP TD1 tangent delta / power factor measuring, page 18.

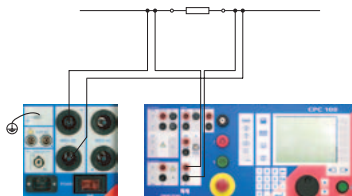
# CPC 100 Applications



## RESISTANCE

### Resistance $\mu\Omega$ measurement, Ground Resistance

VWithstand	PolCheck	Resistance	RWindir
Range: 400A DC	R min: n/a		
I test: 0.0 A	R max: n/a		
<input checked="" type="checkbox"/> Auto			
I DC: 299.99 A			
V DC: 1.2850 V	<input type="checkbox"/> Manual input		
R: 4.283 mΩ			
Assessed: n/a			



### Resistance $\mu\Omega$ Measurement

Measures test objects with very low resistance such as contacts of circuit breakers and buswire connectors

After connecting the test object (4-wires), entering the test current, and pressing the Start button, the test card measures

- the resistance of the test object.

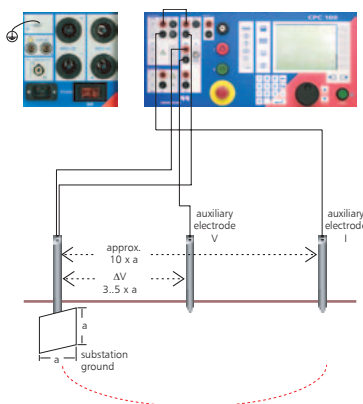
The test current can be selected from 0 ... 400 A.

Duration of the test: ~ 5 s including automatic reporting

Output: up to 400 A DC

Input: up to 10 V DC

TRTapCheck	RGround	Comment
I test: 1.000 A		
f: 128.00 Hz		
I RMS: 879.0 mA		
V RMS: 474.5 mV	7.60 *	
R(f): 228.3 mΩ	X(f): 21.93 mΩ	
Assessed: n/a		



### Ground Resistance

Measures ground resistance or soil resistivity

The ground resistance of substations can be measured with two auxiliary electrodes which are put into the ground. To avoid influences from the mains current and its harmonics, this measurement should preferably be carried out with 128 Hz. The high output power of the CPC 100 ensures a high ratio of the signal level to the noise level. Thanks to the signal processor technology, the measuring procedure is very selective and disturbances by ground currents are reduced to a minimum.

For large grounding systems, the auxiliary electrode for the current injection is replaced by a second grounding system which is connected to the current output of the CPC 100 via an auxiliary line. For this application the use of CP CU1 (see page 19) is recommended to obtain higher output power. For measuring the soil resistivity four auxiliary electrodes are used.

Duration of the test: ~ 5 s including automatic reporting

Output: up to 6 A AC

Input: up to 3 V or 300 V AC and 10 A AC

### Winding Resistance

The winding resistance test is described in the CT section, page 10.



# CPC 100 Applications

## AUTOMATIC TEST PROCEDURES

### Sequencer and Ramping

With general application cards, some simple testing of single phase relays is possible, such as the determination of trip times of I>, V>, V<, or frequency relays. With Sequencer and Ramping the user can create her/his own automatic test procedures.

### Sequencer

#### Typical Applications

- Testing of auto-reclosure cycles with primary current injection up to 2000 A; opening/closing of the circuit breaker contact is detected internally by the OMICRON hardware, so no extra wiring is required;
- Measurement of the opening/closing time of circuit breakers;
- Testing of primary overcurrent relays;
- Testing of low voltage circuit breakers with protection functions; etc.
- Automatic testing with different amplitudes (e.g. CT ratio at 0.05 In, 0.2 In, 0.5 In, 1 In and 1.2 In)

The user can define consecutive states and the transition between states, which can be initiated by a time-out, a trigger, or a combination of the two. Seven successive automatic measurements on predefined levels are possible. Further, the signals can be generated with a repeat function, so that the sequence can be run in an "endless loop"; up to 100 results can be recorded.

Quick Sequencer Sequencer					Insert Card
AC 800A	<input checked="" type="checkbox"/>	<input type="checkbox"/> SDOOT	<input type="checkbox"/> Repeat		Delete Card
A	Hz	Trigger	Thresh	s	Rename Card
400.0	50.00	Overload	n/a	30.000	Clear Results
50.0	50.00	Overload	n/a	30.000	Save As Default
400.0	50.00	Overload	n/a	30.000	
50.0	50.00	Overload	n/a	30.000	
I Out	I AC	Bin/Time			
A	*	A	*	Bin In s	
399.8	0.00	xxx	xxx	290m	
35.6	0.00	xxx	xxx	477m	
399.8	0.00	xxx	xxx	291m	
35.6	0.00	xxx	xxx	3.1910	
Assessed: n/a					

#### Example: Overcurrent relay with auto-reclosure function

##### State 1: wait for the circuit breaker (CB) to open

Output 400 A until the trigger condition "Overload" occurs.  
The measurement table displays: relay time + the CB opening time = 290 ms

##### State 2: wait for the CB to close (short dead time)

Output 50 A until the "Overload" condition that started state 2 clears.  
The measurement table displays: short dead time + CB closing time = 477 ms

##### State 3: wait for the CB to open

Like state 1

##### State 4: wait for the CB to close (long dead time)

The measurement table displays: long dead time + CB closing time = 3.1910 s

Quick Sequencer Sequencer Ramping					Insert Card
AC 800A	<input type="checkbox"/>	<input type="checkbox"/> SDOOT			Delete Card
Amplitude	50.00 Hz	Start val:	100.0 A		Rename Card
A	s	Trigger	Thresh		Clear Results
200.0	10.000	Binary	n/a		Save As Default
0.0	10.000	Binary	n/a		
I Out	I AC	Bin/Time			
A	*	A	*	Bin In s	
170.29	0.00	xxx	xxx	7.1750	
152.35	0.00	xxx	xxx	1.1000	
Assessed: n/a					

### Ramping

The functionality of the Ramping test card includes the automatic measurement of the pick up and drop off values of overcurrent relays. Also, CB contact resistances can be measured with ramp functions to avoid induced voltages in CT windings. Up to five ramps can be defined, with detailed results being available for each.

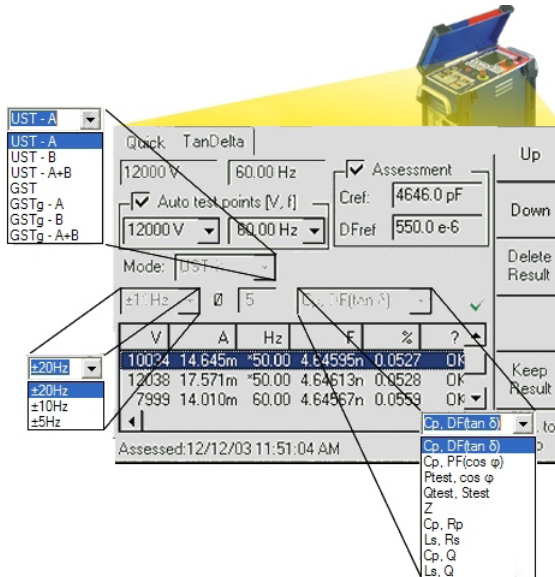
# CPC 100 Applications

## POWER FACTOR & IMPEDANCE MEASURING

TD1

### Insulation Diagnosis (Tangent Delta / Power Factor Test)

The condition of the insulation is an essential aspect for the operational reliability of electrical power transformers, generators, and other high voltage equipment.



CPC 100 + CP TD1 provide laboratory precision for capacitance and dissipation / power factor measurements in the field.

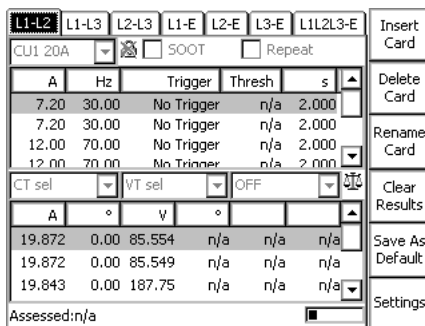
Quantities measured include:

- Capacitance Cp
- Dissipation factor  $\tan \delta$  (tangent delta)
- Power factor  $\cos \phi$
- Power (active, reactive, apparent)
- Impedance (absolute value, phase, inductivity, resistance, Q)

CU1

### Primary Measurements (Line & Ground Impedances, k-factors, mutual coupling)

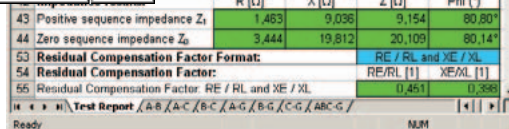
Accurate data of the primary lines, feeders, and grounding are critical for operational reliability of electrical power systems where modeling programs are used for design or when protective settings are applied.



CPC 100 + CP CU1 coupling unit provides the ability to safely and accurately measure parameters of overhead lines, power cables, and grounding grids. This system can determine:

- Line Impedances & k-factors of overhead lines or power cables,
- Mutual coupling of parallel lines,
- Coupling of power lines to signal cables,
- Ground Impedances of large substations,
- Step & touch voltages

Transferred measurement results >



## REPORTS & OFFLINE TEST PREPARATION

The screenshot shows the COMECORON software interface. The top window displays the file explorer with the following structure:

- Desktop
  - CTExcitation\_1.vml
  - CTExcitation\_2.vml
  - CTExcitation\_3.vml
- My Documents
- My Computer
- My Network Places
- Recycle Bin
- COMECORON Applications
- COMECORON Devices
  - PL19123
  - Logfiles
  - Tests
    - 01\_Substation Berlin

The bottom window displays the test results for "CTExcitation\_Load". It includes the following information:

- Card Type:** CTE excitation
- Burn Time:** 04/24/2008 09:14:14
- Overload:** no
- Assessment:** n/a
- V max:** 500.0 V
- I max:** 0.50000 A
- Frequency:** 50.00 Hz
- Automatic:** yes
- Results:**

The results table shows the following data points:

V	I
158.19 V	604.94 mA
155.39 V	381.04 mA
153.90 V	151.35 mA
151.59 V	9.19 mA
145.57 V	6.8480 mA
139.40 V	3.9500 mA
133.20 V	2.9460 mA
126.96 V	2.5110 mA
120.73 V	2.2110 mA
114.49 V	2.0030 mA
108.24 V	1.8490 mA
102.01 V	1.7290 mA
96.76 V	1.6210 mA
89.52 V	1.5250 mA
83.28 V	1.4250 mA
77.03 V	1.3370 mA
70.79 V	1.2470 mA

The graph shows the relationship between V/I (Y-axis, logarithmic scale from 1 to 500) and I/A (X-axis, logarithmic scale from 100n to 100m). The data points are plotted as blue dots, and a dashed line represents the theoretical relationship. The graph shows a sharp increase in V/I as I/A increases, reaching a plateau around 100 V/I for I/A values above 10m.

**MICROMETER CPC 6 (full) - D:\Users\PMT\SCP Live\CPC 100 Product Fact Book Measurements**

File Edit Insert Test Card Options ?

New Open Save

Name	Date/Time	Result	Assess.
Test Daten		n/a	
Berechnung	20.09.2002 14:50	No	n/a
Birde		Yes	OK
Widerstand		Yes	OK
Konvergenz		No	n/a
Magnet-Kurve		Yes	OK
GGF (Überstr...		No	n/a
Isolation		Yes	OK
PostCheck		Yes	OK

1 prim.:  1 sec.:   
 1 test:  Freq.:  ☒ Auto  
☐ Use external booster ☐ Current clamp 1 sec.  
 1 prim.:   
 1 sec.:  ☐ Manual input  
 Ratio:    
 Polarity:  ☒ Measure burden  
 Y sec.:   ☐ Manual input  
 Burden:  Cos  $\phi$ :

Ready



# CPC 100 Accessories

## CP TD1 TANGENT DELTA & POWER FACTOR

The CP TD1 capacitance and tangent delta / power factor measuring instrument is an accessory unit to the CPC 100, completing its use for power transformer testing with the ultimate insulation diagnosis solution. Controlled by the CPC 100, the CPC 100 + CP TD1 combination provides fully automated testing and reporting capabilities for the comprehensive testing of transformer parameters within one portable system.

The application of innovative measurement techniques and the use of high precision components in the CP TD1 bring laboratory precision with a rugged design into the field of insulation condition testing. The CP TD1 also offers new test methods such as testing with frequency sweeps. A custom-built trolley allows for practical handling on and off-site along with easy and quick breakdown into portable components.

Quantities measured include:

- Capacitance  $C_p$
- Dissipation factor  $\tan \delta$  (tangent delta)
- Power factor  $\cos \varphi$
- Power (active, reactive, apparent)
- Impedance (absolute value, phase, inductivity, resistance,  $Q$ )

### Technical Data CP TD1 (with CPC 100)

The CP TD1 is connected via interfaces to the CPC 100 and thus does not need further control elements.

High voltage output			
V	I	$t_{\max}$	at f (Hz) <sup>1</sup>
0...12 kV AC	300 mA	>2 min	15 ... 400
	100 mA	>60 min	

Voltage / current measurement		
Range	Resolution	Accuracy
12000 V AC	1 V	error < 0.3 % reading + 1 V
5 A AC	5 digits	error < 0.5 % reading
8 mA AC		error < 0.3 % reading + 100 nA

Capacitance $C_p$ (equivalent parallel circuit)			
Range	Resolution	Accuracy	Conditions
1 pF ... 3 $\mu$ F	6 digits	error < 0.05 % reading + 0.1 pF	< 8 mA
		error < 0.2 % reading	> 8 mA

<sup>1</sup> Signals below 45 Hz with reduced values possible. Capacitive linear loads.



CP TD1 with transport trolley

Dissipation factor DF ( $\tan \delta$ )			
Range	Resolution	Accuracy	Conditions
0 ... 10 % (capacitive)	5 digits	error < 0.1 % reading + 0.005 %	15 ... 70 Hz < 8 mA
0 ... 100 (0..10000 %)	5 digits	error < 0.5% reading + 0.02 %	-

Power factor $\cos \varphi$			
Range	Resolution	Accuracy	Conditions
0 ... 10 % (capacitive)	5 digits	error < 0.1 % reading + 0.005 %	15 ... 70 Hz < 8 mA
0 ... 100 %	5 digits	error < 0.5 % reading + 0.02 %	-

Representation of the following values is also possible:

- Power (active, reactive, apparent)
- Impedance (absolute value, phase, inductivity, resistance,  $Q$ )

Nominal voltage CPC 100	1 x 100 ... 240 VAC / 50 ... 60 Hz / 16 A
Operating temperature	-10 ... +55 °C (+14 ... +131 F)
Transport and storage	-20 ... +70 °C (-4 ... +158 F)
Relative humidity	5 ... 95 %, non condensing

# CPC 100 Accessories

## CP CU1 LINE & GROUND IMPEDANCE

The multifunctional primary test system CPC 100, in combination with the coupling unit CP CU1, is the world-wide unique measurement system for:

- Line impedances and k-factors of overhead lines or power cables,
- Mutual coupling of parallel lines,
- Coupling of power lines into signal cables,
- Ground impedances of large substations,
- Step and touch voltages.

The test system overcomes the problem of power system frequency interference that has previously made it necessary to use extremely large, high-power equipment to carry out these measurements. The use of switched mode amplifiers and frequency-shift techniques facilitates accurate measurements with compact portable equipment.



CP AL1 with Adapter

The CP CU1 can be ordered with several accessory kits which facilitate and speed up measurements of step and touch voltages as well as ground impedances of large substations.

### Technical Data CP CU1 (with CPC 100)

For detailed information on the CP CU1 please see our product information brochure "CP CU1 - Extension to the CPC 100".

Current Output Ranges	
Current range	Compliance voltage
0 ... 10 A rms	500 V rms
0 ... 20 A rms	250 V rms
0 ... 50 A rms	100 V rms
0 ... 100 A rms	50 V rms

Measuring Transformers		
VT	600 V : 30 V	class 0.1
CT	100 A : 2.5 A	class 0.1

#### Mechanical Data

Protection IP 20  
Dimensions (w × h × d) 450 x 220 x 220 mm / 17.7 x 8.7 x 8.7 inch  
Weight 28.5 kg / 63 lb

#### Environmental Conditions

Operating temperature -10 ... +55 °C / 14 ... 131 °F  
Transport & storage Temperature -20 ... +70 °C / -4 ... 158 °F  
Relative humidity 5 ... 95 %, non condensing  
Safety EN 61010-1  
Prepared for IEEE 510, EN 50191 (VDE 104), EN 50110-1 (VDE 105 Part 100), LAPG 1710.6 NASA

<sup>1</sup> At an ambient temperature of 23 °C ± 5 °C / 73 °F ± 10 °F



Multifunctional primary test system CPC 100 in combination with the coupling unit CP CU1 and the grounding box CP GB1

CP CU1 requires the CPC 100 to have the CP Sequencer card to work  
CPC 100 includes the transport case

### Technical Data CP GB1

#### Electrical Data

Nominal AC spark-over voltage < 1000 V rms  
Short circuit proof up to 30 kA for 100 ms

#### Mechanical Data

Dimensions (Ø × h) 200 x 190 mm / 7.9 x 7.5 inch  
Weight 6.8 kg / 13.2 lb (including grounding cable)

#### Accessories

Special accessories for step, touch and ground impedance on request

### Overall System (with CPC 100)

#### Output Power<sup>1</sup>

5000 VA, cos φ < 1.0 for 8 s @ 230 V AC mains voltage  
5000 VA, cos φ < 0.4 for 8 s @ 115 V AC mains voltage

Accuracy <sup>1</sup>		
Measured value	Typical accuracy	Current range
0.05 ... 0.2 Ω	1.0 ... 0.5 %	100 A
0.2 ... 2 Ω	0.5 ... 0.3 %	100 A
2 ... 5 Ω	0.3 %	50 A
5 ... 25 Ω	0.3 %	20 A
25 ... 300 Ω	0.3 % ... 1.0 %	10 A

For detailed information about the CP CU1 please ask for the respective product brochure or visit our website.

# CPC 100 Accessories

## 12 KV OIL TEST CELL, COMPENSATING REACTOR

### 12 kV Oil Test Cell CP TC12

The CP TC12 is used in conjunction with the CPC100 and the CP TD1 to measure the Permittivity and Tangent Delta / Power Factor of insulation liquids, e.g. transformer oil. The three-electrode design with guard allows precise measurement, especially of small losses.

The circular electrodes are constructed from rigid stainless steel and require a sample of 1.2 to 2 liters (41 to 68 fl.oz.). Electrical connection to the Test Cell is made using the standard cables provided with the CP TD1.

#### Technical Data

Cell Type:	Three-terminal, guarded
Cell Gap Spacing:	11 mm (2.31"), nominal
Sample Volume:	1.2 liters (min) to 2 liters (max) (41 to 68 fl.oz.)
Cell Capacitance:	65 pF, nominal (in air)
Maximum Test Voltage:	12 kV rms
Voltage Operating Range:	2.5 to 12 kV for a stress of 200 to 1100 V/mm (7.87 to 43.31 V/inch)
Connectors:	6 mm (0.24") sockets for high voltage cable 4 mm (0.15") sockets for measuring cables
Dimensions:	22 x 25 cm (8.7" x 10.2") [diameter x height]
Weight:	approx.. 6 kg (13.2 lbs.)
Article No.:	VEHZ0601



### Compensating Reactor CP CR500

The CP CR500 allows Power Factor / Tangent Delta measurements of large motors and generators. In combination with the multifunctional Primary Test Set CPC 100 and the Tangent Delta / Power Factor unit CP TD1 one CP CR500 compensates capacities of up to 500 nF.

To compensate even larger capacities, two devices can be connected in parallel. This allows compensation of up to 1000 nF.

#### Benefits:

- Portable high power solution due to size and weight
- Flexible by using different numbers of units and/or by changing the test frequency (35 ... 85 Hz)

#### Technical Data (with one CP CR500)

Maximum Test Voltage:	12 kV rms ( $\geq$ 50 Hz)
Inductors:	2 x 40 H
Current Compensation:	2 x 1 A
Capacity Compensation:	2 x 250 nF (50 Hz) 2 x 500 nF (35 Hz)
Dimensions:	468 x 394 x 233 mm / 18.6 x 15.5 x 9.2"
Weight:	33 kg / 73 lbs
Article No.:	VEHZ0602 (single unit) VEHZ0603 (set of two units)



For detailed information about the CP TC12 or the CP CR500 please ask for the respective product brochure or visit our website.



# CPC 100 Accessories

## CURRENT BOOSTER

### Current Booster CP CB2

Tests applications requiring up to 2000 A

The output current of the CPC 100 can be increased to up to 2000 A by an electronically controlled current booster. The CP CB2 can be connected close to the busbar using short high current leads and to the CPC 100 with a long control cable.

**Dimensions:** 186 x 166 x 220 mm (7.3 x 6.5 x 8.7 "), without handle

**Weight:** 16.0 kg, 35.3 lbs

**Included in option:**

- CP CB2 Current Booster
- Connection cable to CPC 100
- High current cable set for CP CB2
- Grounding cable (same as for CPC 100 shown on page 23)
- Transport case (similar model as for CPC 100 shown on page 22, but with different inner shell)



Current outputs					
Range	Amplitude	t <sub>max</sub> <sup>1</sup>	V <sub>max</sub> <sup>2</sup>	P <sub>max</sub> <sup>2</sup>	f
1000 A AC <sup>3</sup>	0...1000 A	25 s	4.90 V	4900 VA	15-400 Hz
	0...500 A	30 min	5.00 V	2500 VA	15-400 Hz
2000 A <sup>4</sup>	0...2000 A	25 s	2.45 V	4900 VA	15-400 Hz

Internal measurement of outputs						
Output	Guaranteed accuracy			Typical accuracy		
	Amplitude		Phase	Amplitude		Phase
	Reading	Full Scale	Full Scale	Reading	Full Scale	Full Scale
2000 A AC	0.25 %	0.25 %	0.50 °	0.13 %	0.13 %	0.25 °
1000 A AC	0.25 %	0.25 %	0.50 °	0.13 %	0.13 %	0.25 °

<sup>1</sup> With mains voltage 230 V at 23 °C ± 5 °C (73 F ± 10 F) ambient temperature.

<sup>2</sup> Signals below 50 Hz or above 60 Hz with reduced values possible.

<sup>3</sup> Outputs in series.

<sup>4</sup> Outputs in parallel.



The Current Booster CP CB2 connected to CPC 100

### CP CB2 Accessories



VEHK0610 - High current cable set for CP CB2  
4 x 1.5 m with 95 mm<sup>2</sup> with plugs and clamps  
1 x 0.6 m with 95 mm<sup>2</sup> for serialization of outputs



VEHK0611 - Connection cable to CPC 100 for CP CB2  
20 m, 3 x 2.5 mm<sup>2</sup>

# CPC 100 Accessories

## POLARITY CHECKER, TRANSPORT CASES

### Polarity Checker (Replacement for Battery Checking Method)

Checks a series of test points for correct wiring

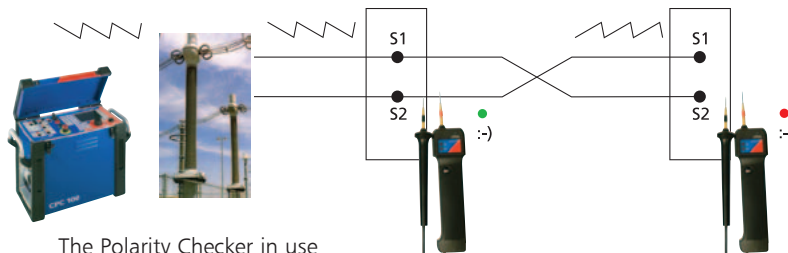
Just inject a the special continuous test signal at one point with the CPC 100 and check the polarity at all terminals with CPOL as shown in fig. 1, getting a clear indication whether the polarity is OK (green LED) or not (red LED).

This procedure is much faster than the conventional method and can easily be performed by a single person.

Duration of the test: depending on the number of test points; 3-5 s per test point

TRRatio	VWithstand	PolCheck	Resistance	Add Card
Range: AC 800A				Delete Card
Ampl.: 600.0 A				Intermittent
T on: 1.000 s		T off: 9.000 s		Rename Card
Location		Assessment		Clear Results
Point 1		OK		Save As Template
Point 2		OK		
Point 3		OK		
Point 4		Failed		

Polarity check test card



The Polarity Checker in use



CPOL polarity checker

### Transport cases

OMICRON offers sturdy transport cases with hard-form interiors. Recommended for heavy transport stress or for shipping.

Case model	For CPC 100	Carry bag for CPC 100 auxiliaries	For Current Booster CP CB2
Capacity	CPC 100, manual, power cord	Cable sets, current clamps	CP CB2, connection cable, high current cable set
Dimensions (L x H x D)	700 x 450 x 500 mm (27.6" x 17.7" x 19.7")	400 x 250 x 450 mm (15.7" x 9.8" x 17.7")	700 x 450 x 360 mm (27.7" x 17.7" x 14.2")
Weight	10.8 kg (23.8 lb.)	9.2 kg (20.3 lb.)	9.0 kg (19.8 lb.)
Article No.	VEHP0061	VEHP0069	VEHP0071



## CPC UTILITIES

### Cables, clamps and plugs ( • supplied with CPC 100 Standard Package)



High current cable set (800 A, 70 mm<sup>2</sup>)

standard: 2 x 6 m VEHK0612  
alternative: 2 x 9 m VEHK0617



High voltage cable set  
(2000 V, screened, 0.5 mm<sup>2</sup>)  
standard: 2 x 6 m VEHK0613  
alternative: 2 x 10 m VEHK0618



HV clamps for connection with  
4 mm banana plugs  
VEHZ0610



Grounding cable (GR/YE) 1 x 6 m,  
6 mm<sup>2</sup> with connection clamp  
VEHK0615



Measurement cable set 2.5 mm<sup>2</sup>  
standard: 6 x 6 m VEHK0614  
alternative: 6 x 10 m VEHK0619



Low voltage adapter  
VEHK0623  
Low voltage plug  
VEHS0610  
for V2 AC low voltage level input (0-3 V)



(symbol picture)

USB memory stick 512 MB  
VEHZ0666



Power cord with:  
VII connector  
(standard)  
VEHK0621



open ends  
(alternative)  
VEHK0616



ZA connector  
(alternative)  
VEHK0620



BS connector  
(alternative)  
VEHK0624

### Current Clamp



Active AC and DC current probe with voltage output.  
2 measuring ranges: 10 A and 80 A  
Frequency range: DC to 10 kHz  
Accuracy: error < 2 % for currents up to 40 A and  
frequencies up to 1 kHz  
Phase error: < 0.5° at 50/60 Hz  
Length: 230 mm (9.1")  
Article No.: VEHZ4000



# CPC 100 Package Options

## PACKAGE OPTIONS

### CPC 100 Package Overview

Item No.:	Description:	Packages:	CPC 100 – Standard, VE000611	CPC 100 – Enhanced, VE000621	CP TD1 Test Set, VE000640	CP Transformer Test Set, VE000645
	<b>CPC 100</b> – Multifunctional Primary Test System including hardware and built in software for testing of the CT's, VT's, power transformers, resistance etc. The basic system includes: <ul style="list-style-type: none"> <li>CPC 100 multifunctional test set hardware 110/230 V 50/60 Hz with AC 800 A; AC 2000 V; DC 400 A</li> <li>QUICK test card (manual control of the test set)</li> <li>Transport case with wheels for CPC 100 (VEHP0061)</li> <li>Carry bag for CPC 100 accessories (VEHP0069)</li> </ul>		3	3	3	3
VESM0610	<b>CP CT test cards:</b> ratio (V), ratio (I), excitation curve, burden, winding resistance, voltage withstand test (2 kV), Rogowski coils, Low power CT's		3	3		
VESM0615	<b>CP VT test cards:</b> ratio, burden, voltage withstand test (2 kV), electronic voltage transformers		3	3		
VESM0620	<b>CP transformer test cards:</b> winding resistance, tap changer check, ratio, voltage withstand test (2 kV)		3	3		3
VESM0625	<b>CP resistance test cards:</b> contact resistance ( $\mu\Omega$ ...m $\Omega$ ), winding resistance ( $\mu\Omega$ ...k $\Omega$ )		3	3		
VESM0630	<b>CP ramping test card:</b> programmable ramping generator and determination of thresholds			3		
VESM0635	<b>CP sequencer test card:</b> sequencer test card for testing with different states (required to use CP CU1)			3		3
VESM0640	<b>CP GR - ground resistance test option:</b> includes testing software + hardware accessory (VEHZ0660)			3		
VESM0645	<b>CPOL:</b> polarity checking for CT/VT wiring including software + hardware accessory (VEHZ0650)			3		
VESM0665	<b>CP TD1 test card:</b> capacitance and dissipation / power factor measurements				3	3
VESM0670	<b>CPC editor software:</b> for offline test preparation on a PC		3	3	3	3
VEHK0612	<b>High current cable set:</b> Standard: 2 x 6 m, 70 mm <sup>2</sup> ( 800 A )		3	3		3
VEHK0617	Alternative: 2 x 9 m, 70 mm <sup>2</sup> ( 800 A )		0	0		
VEHK0613	<b>High voltage cable set</b> (2 kV, screened): Standard: 2 x 6 m, 0.5 mm <sup>2</sup>		3	3		3
VEHK0618	Alternative: 2 x 10 m, 0.5 mm <sup>2</sup>		0	0		
VEHK0614	<b>Measurement cable set:</b> Standard: 6 x 6 m, 2.5 mm <sup>2</sup> , 1 x 0.5 m, 2.5 mm <sup>2</sup>		3	3		3
VEHK0619	Alternative: 6 x 10 m, 2.5 mm <sup>2</sup> , 1 x 0.5 m, 2.5 mm <sup>2</sup>		0	0		
VEHZ0610	<b>High voltage clamps:</b> connection with banana plugs 4 mm (1 red, 1 black + 2 Kelvin clamps)		3	3		3
VEHZ0620	<b>Crocodile clamps</b> for connection of the banana plugs 4 mm (2 red + 2 black)		3	3		3
VEHK0615	<b>Grounding cable</b> (GR/YE) 1 x 6 m; 6 mm <sup>2</sup> with connection clamp		3	3	3	3
VEHK0622	<b>Ethernet PC connection cable</b> , 3 m		3	3	3	3
VEHK0623	<b>Low voltage adapter:</b> 4 mm banana to low voltage plug		3	3		3
VEHZ0666	<b>USB memory stick</b> 512 MB		3	3	3	3

Item No.:	Description:	Packages <sup>1</sup> :	CPC 100 – Standard, VE000611	CPC 100 – Enhanced, VE000621	CP TD1 Test Set, VE000640	CP Transformer Test Set, VE000645
VESD0601	User manual		3	3	3	3
VESD0600	Reference manual (included on the CPC Explorer CD-ROM)		3	3	3	3
VEHZ0665	<b>CP SA1 - surge arrestor box</b> for 100 A winding resistance measurement from firmware v1.4 >		3	3		3
VEHZ0644	<b>TH3631- temperature / humidity measurement unit</b> for humidity / ambient & surface temperature measurement					3
VEHK0621	<b>Power cord</b> C 19; 3 x 1.5 mm; 2.5 m Standard: open ends		3	3	3	3
	Alternative: VII connector for most of EU/M.East (VEHK0616) ZA connector for South Africa, Namibia and India (VEHK0620) BS connector for UK, Hong Kong etc. (VEHK0624) Other connectors on request					
OS700002	Standard CPC package, single-user version					
OS700004	Upgrade to Enhanced CPC Package, single-user version					
	<b>Accessories</b>					
VESM0660	<b>CP amplifier test card:</b> for using the CPC 100 like an amplifier					
VEHZ0660	<b>Ground resistance accessory set:</b> 4 electrodes, 50 m cable reel red, 100 m cable reel black					
VEHZ0630	<b>CP CB2 - current booster up to 2000 A:</b> includes connection cable to CPC (VEHK0611), ground cable w/ clamp (VEHK0615), high current cable set w/ plugs & clamps (VEHK0610), including transport case with wheels (VEHP0071).					
VE000641	<b>CP TD1 - TanDelta / Power Factor upgrade</b> includes: CP TD1 12 kV hardware w/ref capacitor + TanDelta test card, TD1 Accessories (cable drums w/ HV & Measure cables, 20 m) + Trolley; (eIFC card if needed - VEHZ0646)					
VEHZ0601	<b>CP TC12 - 12 kV test cell</b> for measuring permittivity and TanDelta (Power Factor) of insulation liquids like transformer oil					
VEHZ0602	<b>CP CR500 - compensating reactor</b> that includes two inductors rated 40 H each, 2 A compensation w/ inductors paralleled (500 nF)					
VEHZ0671	<b>CP CU1 &amp; CP GB1:</b> includes CP CU1 coupling unit w/ accessories for line impedance, k-factor, mutual coupling, ground impedance, step and touch voltage, and signal cable coupling measurements. Includes CP GB1 grounding box (VEHZ0672). <sup>2</sup>					
VEHZ0690	<b>CP SB1 Standard:</b> Automated turns ratio measurement of three-phase transformers.					
VEHZ0692	<b>CP SB1 Advanced:</b> Automated turns ratio, with dynamic & static resistance measurement of three-phase transformers.					
VEHZ0625	<b>Step and touch voltage set</b> for CP CU1 (incl. CP AL1 FFT voltmeter, pair of foot electrodes, ground electr. and accessory cables					
VEHZ0622	<b>Ground impedance set</b> for CP CU1 (includes: GPS Garmin eTrex, Rogowsky coil, 6 cable reels and 3 ground electrodes)					

<sup>1</sup> Customized packages with individual combinations are available on request.

<sup>2</sup> Requires CP Sequencer Test Card

# Current Transformer Testing

## CT Analyzer

OMICRON's CT Analyzer delivers a unique capability for the fast comprehensive testing and calibration of current transformers, for protection and metering engineers as well as CT and switchgear manufacturers.

The equipment provides automatic testing and calibration for all types of low leakage flux current transformers both on-site in the power system as well in the controlled environment of CT and switchgear manufacturers.

A wide range of measurement functions can be provided:

- Burden measurement
- CT Winding resistance measurement
- CT Excitation characteristic recording
- CT transient behavior measurement (IEC 60044-6)
- CT ratio measurement with consideration of nominal and connected burden
- CT phase and polarity measurement
- Determination of accuracy limiting factor (ALF), instrument security factor (FS), secondary time constant (Ts), remanence factor (Kr), transient dimensioning factor (Ktd), knee point voltage/current, class, saturated and non saturated inductance
- Assessment according to defined standards: IEC 60044-1, IEC 60044-6, IEEE C57.13-1993

### Unique CT Analyzer Features & Benefits

- Extremely small and lightweight (< 8 kg / 17 lb), particularly beneficial for on-site testing.
- Reduced commissioning time due to fully automatic testing according to IEC 60044-1, IEC 60044-6 and IEEE C57.13. Results within seconds.
- First portable device that can test CTs built according to IEC 60044-6 with defined transient behavior.
- Calibration of measuring transformers: A typical accuracy of 0.02 % / 1' enables field calibration and verification of class 0.1 CTs for metering.
- Automated assessment according to the defined standards (IEC 60044-1, IEC 60044-6 or IEEE C57.13-1993) also of specialized CTs such as PX, TPS, TPX, TPY and TPZ
- Allows testing of CTs for power frequencies from 16.7 to 400 Hz.
- "Name plate guesser" function allows automatic parameter search and analysis of CTs with unknown data (European Patent EP1 653 238 B1).
- High level of safety - all tests use low voltages (120 V) (European Patent EP 1 398 644 A1).
- Precise measurement of ratio error and phase displacement up to x-times the rated current and for all burden values without the need to connect burden hardware, independent of the application (e.g. bushings and GIS).
- Test of CTs with very high knee point voltages (up to 30kV)
- Automatic demagnetization of the CT after the test.



*CT Analyzer - The unique analyzing solution for current transformers.  
[European Patent EP 1 398 644 B1 and EP 1 653 238 B1]*

### Calibration

A typical accuracy of 0.02 % / 1' enables field calibration and verification of class 0.1 CTs for metering.

### Assessment

Automatic result assessment according to the defined standard (IEC 60044-1, IEC 60044-6 or IEEE C57.13-1993) using implemented expert knowledge even for CTs defined according to IEC 60044-6 with defined transient performance (TPS, TPX, TPY, TPZ).

### Reporting

Comprehensive viewing and printing of test reports on a PC for different applications, standards and classes using the predefined Microsoft Excel™ templates.

### Simulation

Existing test reports can be loaded at any time to recalculate the test results for different burden values and primary currents. This way, no further on-site measurements are necessary to verify whether a changed burden influences the behavior of a CT. The recalculation of the test results can be easily performed in the laboratory using the existing measurement data

### Remote Control and Test Automation

Remote interface to integrate CT-Analyzer into an automatic production process. CT-Analyzer can fully be controlled over the remote interface. All parameters can be read from the device or from a test report with a simple to use software interface.

### Ordering Information

CT Analyzer CT1 incl. accessories VE000652  
CT Analyzer standard package VE000650  
Accessories set for CT Analyzer

For detailed information about the CT Analyzer please ask for the respective product brochure or visit our website.



# Sweep Frequency Response Analyzer

## FRAnalyzer

The FRAnalyzer detects defects in power transformer windings and faults in the magnetic core. After the transportation of transformers or following through faults with high currents the frequency response test should be made to ensure that the windings or core were not damaged.

Unique features of FRAnalyzer:

- High reliability of results due to the applied measurement method (SFRA) and innovative connection technique specially designed for SFRA testing
- Extremely small size of the test instrument through the use of leading edge technology
- Ease of use because of creative software
- Portability resulting from battery operation

For high frequencies the equivalent circuit diagram of a transformer winding can be drawn as a complex network of resistors, inductors and capacitors. The frequency response of this network is unique like a fingerprint. Winding deformation causes one or more of the capacitors in this network to be changed. To identify these changes, which can be quite small, the new fingerprint is compared to reference results. Deviations are an indicator of:

- Coil deformation - axial & radial
- Faulty core grounds
- Partial winding collapse
- Hoop buckling
- Broken or loosened clamps
- Shorted turns & open windings



### Highest possible repeatability

of the test results due to screw-type-connection clamps which provide reliable electrical contact to the transformer and an innovative double-braid solution which forms a shield around the bushing.

## Technical Data FRAnalyzer

**Frequency range** 10 Hz to 20 MHz

### Source Output

FRA Method Sweep frequency  
Output impedance 50  $\Omega$   
Connector BNC (double shielded)  
Amplitude 2.83 V p-p

### Inputs (Reference - CH1, Measurement - CH2)

Impedance 50  $\Omega$  // 1 M $\Omega$  (selectable)  
Connector BNC (double shielded)  
Dynamic range > 120 dB  
Accuracy < 0.1 dB down to -80 dB,  
< 0.3 dB down to -100 dB

### Mechanical data / supply voltage

Weight  
Instrument: < 2 kg / 4.4 lbs without measuring cables  
Complete set: 21 kg / 46.3 lbs  
Dimensions (w x h x d)  
Instrument: 26 x 5 x 26.5 cm / 10.25 x 2 x 10.5 inch  
Complete case: 42 x 21 x 55 cm / 16.5 x 8.3 x 21.5 inch  
DC power supply DC 10 V to 24 V / 10 W

### PC Software for

- operation of the FRAnalyzer
- diagnosis of the measuring results
- database handling
- reporting

### PC requirements (minimum)

Interface	USB 1.1
PC operating system	Windows™ XP or Windows™ Vista
Processor	Pentium™ 1 GHz or higher
Memory	1 GB RAM or higher
Drive	CD-ROM

### Ordering Information

VE000660	FRAnalyzer complete set (transport case included)
VEHZ0673	Clamp set for short bushings

For detailed information about the FRAnalyzer please ask for the respective product brochure or visit our website.

# Dielectric Response Analyzer

## DIRANA

DIRANA determines the dissipation factor of nearly any kind of insulation including transformers, bushings, cables, electrical machines in an extremely short time. Using an advanced analysis software, it determines the water content and oil conductivity in oil-paper-insulations.

### Applications

- Measurement of dissipation factor, capacitance, permittivity, resistance and polarization current of HV insulations
- Analysis of water content in oil-paper-insulations of power and instrument transformers (also for insulations of aged transformers)
- Diagnosis of OIP, RBP and RIP HV bushings
- Diagnosis of generator and motor insulations
- Diagnosis of cable insulations

Water is an ageing product and accelerates the further deterioration of cellulose through de-polymerization. In addition high water content in oil may cause bubble formation and lead to unexpected electrical breakdowns. DIRANA uses two well-established dielectric response measuring methods: The Polarization Depolarization Current (PDC) method in the time domain and the Frequency Domain Spectroscopy (FDS) in the frequency domain.

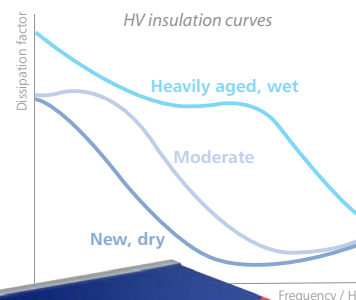
The time domain method enables a fast measurement, but has limited accuracy at higher frequencies. In practice the typical upper frequency limit is 1 Hz. The frequency domain method can be applied to low and high frequencies, but it needs a long measuring time for very low frequencies. The combined use of both methods makes DIRANA the fastest dielectric response analyzer on the market. Measurements at higher frequencies are done in frequency domain, whereas the built-in PDC device accelerates the measuring time for the frequencies below 0.1 Hz.

The combination of the time and frequency domain measuring method reduces the measuring duration by 53 % compared to mere frequency domain measurements. For instance, data acquisition for a frequency domain measurement from 1 kHz down to 0.1 mHz will typically take 6 hours, DIRANA will acquire this data in less than 3 hours.

Two measurement channels instead of one channel enable the simultaneous measurement of two insulation gaps like HV to LV winding and LV to Tertiary winding which results in an additional time savings of 50 %.

The easy-to-use software determines moisture content in the solid insulation. DIRANA analyzes the dielectric response and determines the humidity in the solid insulation. The automated algorithm compensates for disturbing influences such as temperature, insulation geometry, oil conductivity and aging by-products.

Conductive aging by-products appear as water and cause an over-estimation of the moisture content leading to unnecessary drying. DIRANA compensates for this influence and thus reliably detects moisture even in aged transformers.



### Technical Data

Test modes: UST A, UST B, UST A+B, GST, GSTa, GSTb, GSTa+b

#### PDC:

Current measurement

Range:  $\pm 20$  mA,

Resolution: 0.1 pA

Input resistance: 10 kOhm

Accuracy: 0.5 %  $\pm$  0.1 pA

#### Voltage source

Measurement voltage:  $\pm 200$  V, variable

Maximum continuous output current: 50 mA

Time range: 1-10,000 s = 1-0.0001 Hz

#### FDS:

Measurement voltage: 0-200 V peak

Measurement current: 0-50 mA peak

Capacitance: Range: 10 pF – 10 uF

Dissipation factor range: 0 - 10

Dissipation factor accuracy: 0.5 % +  $10^{-4}$

Dissipation factor resolution: 0 ...10,  $10^{-5}$

Frequency range: 5,000-0.0001 Hz

#### Ranges for the combination PDC + FDS:

Frequency: 0.1 mHz – 5 kHz

(Switch frequency to time domain: 0.1 Hz)

Capacitance: 10 pF – 10 uF

#### Weight

Instrument: < 2.3 kg / 5 lb

Complete case: 16 kg / 34 lb

### Ordering Information

VE000670	Complete DIRANA set (transport case and accessories included)
VEHZ0607	DIRANA accessories
VEHP0072	Transport case for DIRANA

For detailed information about DIRANA please ask for the respective product brochure or visit our website.

# PD Analysis System

## MPD 600

The mtronix MPD 600 Partial Discharge Analysis System is a high-end, high-precision, modular acquisition and analysis toolkit for detecting, recording and analyzing partial discharge events in both laboratory and on-site applications of transformers, rotating machines and cable systems (including HV and EHV cables).

### Features and Benefits

The fully digital system guarantees:

- true parallel and synchronous multi-channel PD measurements of large systems due to easy expandability to up to 960 channels
- no noise entry from mains supply due to battery operation
- significantly reduced basic noise level due to optical fiber connections
- highest measurement accuracy and sample rate
- a significant improvement in safety and accuracy due to a complete electrical insulation between individual acquisition units and the control PC via a fiber optical network

Active noise suppression means:

- perfect adaptation of the measurement settings to the on-site conditions with a freely selectable center frequency
- outstanding SNR (signal-to-noise-ratio) due to variable bandwidth filters
- easy suppression of phase-fixed noise signals by an unlimited number of gates
- optimum ability to separate internal and external PD using an external gating unit
- dynamic noise gating which enables gating out of unwanted cyclical, non-phase relational pulses
- easy-to-use 3PARD (Three-Phase Amplitude Relation Diagram) and 3CFRD (3 Center Frequency Relation Diagram) functionality which separate noise from inner PD

Innovative user interface provides:

- different user interface modi according to user demands
- multiple visualization possibilities of PD events to match the user requirements
- full overview of all relevant data like PD level, test voltage, system status etc. according to IEC 60270-2000
- intuitive oscilloscope functionality and view
- support of RIV and DC measurements

Real-time & data post processing:

- replay of the measurement enables comprehensive assessment of the PD measurement back in the office
- easy-to-use 3PARD functionality allows the separation of several PD faults
- Microsoft® Excel-based report generator gives the possibility to create customized reports

### Applications

Detection, recording and analysis of partial discharges in both laboratory and on-site applications of transformers, rotating machines and cable systems (including HV and EHV cables).



### Technical Data

Power Supply:	8 – 12 V DC external 100 – 240 V, 50 – 60 Hz Li-Ion battery 11.2 V / 4.8 Ah
Connectors:	1 x fiber optical network 2 x BNC
Indicators:	2 x LED
Temperature:	0 °C ... 55 °C (operating) -10 °C ... 70 °C (storage)
Humidity:	5 % ~ 100 % non-condensing
Inp. Frequency Range:	V input: 0 Hz – 4.3 kHz PD input: 0 Hz – 20 MHz
Inp. Impedance:	V input: 1 M $\Omega$ , in parallel 1 $\mu$ F PD input: 50 $\Omega$
Input Voltage:	V input: 60 V rms (max) PD input: 10 V rms (max)
Dynamic Range:	V input: 102 dB PD input: 132 dB (overall) 70 dB (per input range selection)
Measurement Uncertainty:	PD level: $\pm$ 2 % of calibrated PD value voltage: $\pm$ 0.05 % of calibrated voltage frequency: $\pm$ 1 ppm

### Ordering Information

VE004110	Single-Channel PD measuring system
VE004130	Three-Channel PD measuring system
VE004120	Hardware Gating system
VESM4101	Optional software module ADVANCED
VESM4102	Optional software module CABLE
VESM4103	Optional software module REPORT

Various charge calibrators and signal aquisition accessories available upon request

Easiest operation in routine test applications is the speciality of the new MPD 500. More information about this product is available on our website.

For detailed information about the MPD 500 or MPD 600 please ask for the respective product brochures or visit our website.



# TanDelta Measuring System

## MI 600

The mtronix MI 600 universal current measuring system is a high-precision, modular acquisition and analysis system for gauging current and key characteristics of high-voltage equipment, including dissipation factor / power factor and capacitance. Complete electrical insulation between acquisition units and the control PC provide superior safety in high-voltage setups. High-resolution digital processing enables exceptional measurement precision. The easy-to-use control software features various real-time visualization and monitoring options, and integrates with multiple mtronix products.

### System Features

- Modular, compact design. The MI 600 consists of two acquisition units, a fiber optical USB controller and a PC. USB 2 technology allows for plug-and-play with any recent desktop, rack-mount, or laptop computer.
- Complete electrical insulation between the acquisition units and the control station is achieved by means of optical fibers, each of which can be up to 2 km in length. This guarantees unprecedented safety and flexibility.
- Maintenance-free operation. No controls are present on the acquisition units. All functions are available under remote control from the software.
- Superior precision and performance. The MI 600 features latest digital technology and advanced software design. High-speed and high-resolution A/D converters coupled with sophisticated digital processing algorithms deliver outstanding accuracy.
- Low power consumption. Optimized for battery operation due to a power consumption of less than 4 W in measuring mode. In standby mode, each acquisition unit consumes less than 10 mW.
- Wide input range. The MI 600 features an 11-level input gain control that is adjustable via the control software. Its high-sensitive input reliably resolves currents as low as 20  $\mu$ A. An on-board shunt, automatically deployed under software control, enables input currents of up to 100 mA to be directly measured without the need for an external shunt.

### Ordering Information

VE004400 MI 600-2 Dual-Channel TanDelta Measurement System:  
= 2 x measurement unit MI 600, controller unit MCU 502  
with USB cable, precision shunt 4 A, basic SW package, user  
manual, fiber optic cables, measurement cables, power  
supplies, batteries and charger

Separately available accessories:

VEHZ4112 4 A precision shunt  
VEHZ4114 15 A precision shunt  
VEHZ4113 28 A precision shunt  
VEHZ4105 MPP 600 Li-Ion battery set incl. combined charger / power supply and cable  
VEHZ4106 MPP 600 Li-Ion battery, 11.2 V / 4.8 Ah  
VEHP0040 mtronix aluminum case MBT 560 for 600 series  
VEHZ4121 Adapter for measurement tap of Micafil bushing type RTKG  
VEHZ4122 Adapter for measurement tap of F&G (HSP) bushing type EKTf  
VEHZ4123 Adapter for measurement tap of HSP bushing type SETf



### Specifications Acquisition Unit

Dimensions (w x d x h)	110 x 190 x 44 mm
Power Supply	9 – 12 V DC, External 100 – 240 V, 50 – 60 Hz battery pack incl., Li-Ion battery 11.2 V / 4.8 Ah
Indicators	2 x LED: Stand-by / Power, Optical Fiber Data Integrity
Fiber Optics	2 x ST
Input Conn.	1 x TNC
Temp.	0 °C ... 45 °C (Operating), -10 °C ... 60 °C (Storage)
Humidity	5 % ~ 80 % Non-condensing
Input Freq.	5 Hz – 50 kHz
Input Imped.	50 Ohms
Input Current	20 $\mu$ A – 100 mA rms (direct)
Extern. Shunts	4 A, 15 A, 28 A

### Measurement Accuracy

Dissipation factor / power factor	$\pm (2E^{-5} + 2 \% \text{ of Display Value})$
Test Object Capacitance	$\pm 0.25 \% \text{ of Display Value}$

### MI 600 Requirements

Operating System	Windows™ 2000 Professional, XP or VISTA
Processor	Pentium® 4 ( $\geq 2.5$ GHz), or M ( $\geq 1.5$ GHz), Core™ or Core™ 2, AMD Athlon™ 64 or Turion™ 64 processor
Memory	512MB RAM (1 GB RAM recommended)
Interface	USB 2.0 compatible

For detailed information about the MI 600 please ask  
for the respective product brochure or visit our website.

## CONTACT ADDRESSES

### Americas

#### **OMICRON electronics Corp. USA**

12 Greenway Plaza, Suite 1510  
Houston, TX 77046 / USA  
Phone: +1 713 830-4660 or 1 800-OMICRON  
Fax: +1 713 830-4661  
Email: [info@omicronusa.com](mailto:info@omicronusa.com)

### Europe/Africa/Middle East

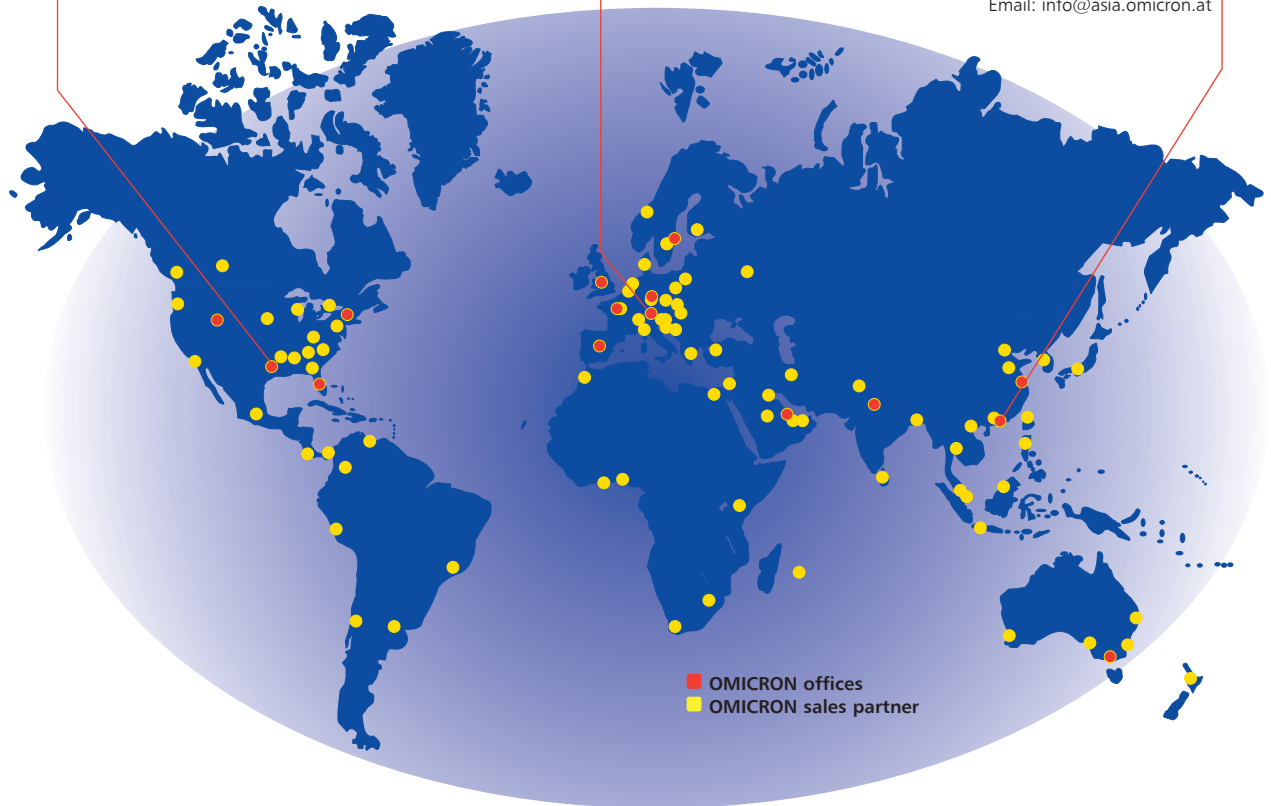
#### **OMICRON electronics GmbH**

Oberes Ried 1  
A-6833 Klaus / Austria  
Phone: +43 5523 507-0  
Fax: +43 5523 507-999  
Email: [info@omicron.at](mailto:info@omicron.at)

### Asia - Pacific

#### **OMICRON electronics Asia Ltd.**

Suite 2006, 20/F, Tower 2  
The Gateway, Harbour City  
Kowloon, Hong Kong S.A.R.  
Phone: +852 2634 0377  
Fax: +852 2634 0390  
Email: [info@asia.omicron.at](mailto:info@asia.omicron.at)



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### **Americas**

#### **OMICRON electronics Corp. USA**

12 Greenway Plaza, Suite 1510  
Houston, TX 77046, USA  
Phone: +1 713 830-4660  
1 800-OMICRON  
Fax: +1 713 830-4661  
[info@omicronusa.com](mailto:info@omicronusa.com)  
[www.omicronusa.com](http://www.omicronusa.com)

### **Asia - Pacific**

#### **OMICRON electronics Asia Ltd.**

Suite 2006, 20/F, Tower 2  
The Gateway, Harbour City  
Kowloon, Hong Kong S.A.R.  
Phone: +852 2634 0377  
Fax: +852 2634 0390  
[info@asia.omicron.at](mailto:info@asia.omicron.at)  
[www.omicron.at](http://www.omicron.at)

### **Europe, Middle East, Africa** **OMICRON electronics GmbH**

Oberes Ried 1  
A-6833 Klaus, Austria  
Phone: +43 5523 507-0  
Fax: +43 5523 507-999  
[info@omicron.at](mailto:info@omicron.at)  
[www.omicron.at](http://www.omicron.at)